

Claims

1. A composition for skin repair comprising:
 - at least one cell growth enhancer and at least one stimulator of cell growth enhancers in an amount effective to increase the growth rate of skin cells;
 - a combination of nutrients in an amount effective to support log phase growth of skin cells;
 - at least one cell protector in an amount effective to protect growing cells and maintain enhanced cellular activity;
 - at least one antioxidant in an amount effective to protect rejuvenated cells from damage;
 - one or more extra-cellular matrix proteins in an amount effective to improve skin structure; and
 - one or more stimulators of extra-cellular matrix protein production in an amount effective to increase the production of extra-cellular matrix proteins in the skin; and
 - a mixture of penetration enhancers in an amount effective to allow penetration of the the dermal layer by the cell growth enhancers, stimulators of cell growth enhancers, nutrients, cell protectors, antioxidants, extracellular matrix proteins, and stimulators of extracellular matrix protein production in an amount effective to promote skin repair; and
 - a biologically acceptable carrier.
2. The composition of claim 1 wherein:
 - at least one cell growth enhancer is selected from the group consisting of cell growth factors;
 - at least one growth enhancer is selected from the group consisting of: cytokines, regulatory factors, angiogenic factors, and adhesion proteins;
 - at least one stimulator of cell growth enhancers is selected from the group consisting of: hyaluronic acid, sodium hyaluronate, ascorbic acid, sodium ascorbate and amphiregulin;
 - the mixture of nutrients effective to support log phase growth of skin cells are selected from the group consisting of: carbohydrates, lipids, phospholipids, fatty acids, essential and non essential amino acids, inorganic salts, minerals, and trace metals, vitamins, nucleosides, purines, and pyrimidines, buffers, other nutrients and, analogs and derivatives thereof ;

at least one cell protector is selected from the group consisting of: insulin, transferrin, selenium, and analogs and derivatives thereof;

at least one antioxidant is selected from the group consisting of: Vitamins E, Vitamin C, and Vitamin K, beta-carotene, coenzyme Q10, cysteine, glutathione, a thiol or analogs and derivatives thereof;

at least one extra-cellular matrix protein is selected from each of the categories consisting of: fibrous proteins, and adhesion molecules;

at least one stimulator of extra-cellular matrix protein production is selected from each of the categories consisting of: growth factors, chemical stimulators and adhesion proteins; and

at least one penetration enhancer is selected from each of the groups consisting of: hydrophobic enhancers, hydrophilic enhancers, and hydrophobic and hydrophilic copolymers.

3. The composition of claim 2 wherein

at least one cell growth factor is selected from the group consisting of: epidermal growth factor (EGF), fibroblast growth factor (FGF), insulin-like growth factor (IGF), granulocyte colony stimulating factor (GCSF), granulocyte macrophage colony stimulating factor (GMCSF), platelet derived growth factor (PDGF), keratinocyte growth factor (KGF), tissue growth factor- α (TGF- α);

at least one cell growth enhancer is selected from the group consisting of: erythropoietin, hematopoietin, prostaglandin, human growth hormone, VEGF, acidic FGF, TGF- α , PDGF, fibronectin, vitronectin, thrombospondin, laminin, tenascin.

4. The composition of claim 2 wherein

the carbohydrates are selected from the group consisting of: monosaccharides, disaccharides, and polysaccharides,

the lipid, phospholipid, and fatty acid are selected from the group consisting of: linoleic acid, lipoic acid, cholesterol, and oleic acid and derivatives thereof; and

the essential and non essential amino acids are selected from the group consisting of: L-Alanine, L-Arginine•HCl, L-Asparagine, L-Aspartic Acid, L-Cystine•HCl, L-Cysteine•2HCl, L-Glutamic Acid, L-Glutamine, Glycine, L-Histidine•HCl, L-Isoleucine, L-Leucine, L-

Lysine•HCl, L-Methionine, L-Phenylalanine, L-Proline, L-Serine, L-Threonine, L-Tryptophan, L-Tyrosine, L-Valine and derivatives thereof;

the inorganic salts, minerals, and trace metals are selected from the group consisting of: copper sulfate, ferric nitrate, ferrous sulfate, potassium chloride, sodium chloride, sodium phosphate monobasic and dibasic, zinc sulfate, sodium acetate (anhydrous), sodium pyruvate, manganese sulfate, ammonium molybdate, nickel chloride, tin chloride, potassium phosphate monobasic and dibasic, sodium silicate, sodium selenite, and derivatives thereof;

the vitamins are selected from the group consisting of: D-Biotin, Choline Chloride, Folic Acid, myo-Inositol, Niacinamide, D-Pantothenic Acid, calcium salt, Pyridoxal•HCl, Pyridoxine•HCl, Riboflavin, Thiamine•HCl, Vitamin B-12 and derivatives and analogs thereof; and

the nucleoside is thymidine or and derivatives thereof;

the purine, and pyrimidine are selected from the group consisting of: Hypoxanthine, Adenine•HCl and derivatives thereof;

the buffer is selected from the group consisting of: HEPES, sodium bicarbonate and analogs and derivatives thereof; and

the other nutrients are selected from the group consisting of: putrescine, protein or protein extract, peptide, peptone, serum or serum substitute, natural extract, plant or animal derived component.

5. The composition of claim 2 wherein

the fibrous protein is selected from the group consisting of: collagens, elastins, α -keratins, and fibroin;

the adhesion molecules are selected from the group consisting of: cadherins, immunoglobulin superfamily, integrins, proteoglycans, and selectins and analogs thereof.

6. The composition of claim 2 wherein,

at least one(?) or more growth factors are selected from the group consisting of: TGF-beta, basic FGF, VEGF, other growth factors;

the one or more stimulators of extra-cellular matrix protein production are selected from the group consisting of: sodium ascorbate, hyaluronic acid, tretinoin (RETIN-A[®]) and analogs, Heparin-Sodium; and

the adhesion proteins are selected from the group consisting of: Fibronectin, Vitronectin, Laminin, thrombospondin, tenasin, stress proteins such as GR78, and short chain peptides.

7. The composition of claim 2 wherein
- at least one or more hydrophobic penetration enhancers are selected from the group consisting of: lipids and lipoproteins;
 - at least one or more hydrophilic penetration enhancers are selected from the group consisting of: detergents, fatty acids, fatty alcohol, alcohols, glycols; and
 - at least one or more hydrophobic and hydrophilic penetration enhancers are selected from the group consisting of hydrophobic and hydrophilic block copolymers:.

8. The composition of claim 1 further comprising
- a transdermal delivery vehicle selected from the group consisting of: liposomes, micelles, emulsions, micro-emulsions, an aqueous solution, a non-aqueous solution; and
 - a transdermal delivery device selected from the group consisting of: an electrical pump, a transdermal patch, an occlusive pad, an adhesive or non-adhesive bandage, a gel, and a film.

9. A composition of claim 7 wherein:
- the lipids comprise an oil selected from the group consisting of: mineral oil, herbal oil, animal oil, synthetic oil, natural oil, citral oil, almond oil, coconut oil, linseed oil, camphor, menthane, and a terpene;
 - the lipoproteins are selected from the group consisting of: shea butter, cacao butter, triglycerides, a plant lipoprotein, wheat protein, soy protein, an animal lipoprotein, and milk;
 - the detergent is selected from the group consisting of: an ionic or nonionic surfactant, Polysorbate 80, Polyoxyethylenesorbitan Monooleate, and sodium dodecylsulfate (SDS);
 - the fatty acids are selected from the group consisting of: linoleic acid, oleic acid;

the fatty alcohol is selected from the group consisting of: Cetyl alcohol (natural and iso-), Oleyl alcohol, Cetyl-stearyl alcohol, Octyl alcohol, Decyl alcohol, Ricinol alcohol, Lauryl alcohol, Stearyl alcohol, Lauro-myristyl alcohol, Tallow alcohol;

the alcohols are selected from the group consisting of: methanol, ethanol, propanol, isopropanol, and analogs;

the glycols are selected from the group consisting of: propylene glycol, butylene glycol and analogs.

10. A composition for skin repair comprising:

at least one growth enhancer is selected from the group consisting of: epidermal growth factor (EGF), fibroblast growth factor (FGF), insulin-like growth factor (IGF), granulocyte colony stimulating factor (GCSF), granulocyte macrophage colony stimulating factor (GMCSF), platelet derived growth factor (PDGF), keratinocyte growth factor (KGF), and tissue growth factor- α (TGF- α);

at least one growth enhancer selected from the group consisting of: cytokines, regulatory factors, angiogenic factors, and adhesion proteins; and

at least one stimulator of cell growth enhancers selected from the group consisting of: hyaluronic acid, sodium hyaluronate, ascorbic acid, sodium ascorbate, and amphiregulin;

a mixture of nutrients in an amount effective to support log phase growth of skin cells comprising at least one carbohydrate, at least one lipid, at least one phospholipid, at least one fatty acid, at least one essential or non essential amino acid, at least one inorganic salt, at least one mineral, at least one trace metal, at least one vitamin, at least one nucleoside, at least one purine, at least one pyrimidine, and at least one buffer;

at least one cell protector in an amount effective to protect growing cells and maintain enhanced cellular activity selected from the group consisting of: insulin, transferrin, selenium, and analogs and derivatives thereof;

at least one antioxidant in an amount effective to protect rejuvenated cells from damage selected from the group consisting of: vitamins, coenzyme Q10, cysteine, glutathione, a thiol or analogs and derivatives thereof;

at least one extra-cellular matrix protein selected from the group consisting of: a fibrous protein and an adhesion molecule;

stimulators of extra-cellular matrix protein production comprising one or more growth factors, one or more chemical stimulators, and one or more adhesion proteins;

penetration enhancers comprising one or more hydrophobic enhancers, one or more hydrophilic enhancers, and one or more hydrophobic and hydrophilic copolymers.

11. A method for repairing mammalian skin comprising:

contacting the skin with a composition of claim 1 for a period of time sufficient for the cell growth enhancers, stimulants of growth enhancers, nutrients, cell protectors, antioxidants, extracellular matrix proteins, and stimulators of extracellular matrix to permeate the skin in an amount effective to repair the skin.

12. The method of claim 11 wherein the repair comprises the rejuvenation of the skin.

13. The method of claim 11 wherein the repair comprises the healing of a wound.

14. The method of claim 11 wherein the repair comprises a reduction in fine lines and wrinkles of the treated skin of 10% or more.

15. The method of claim 11 wherein the mammalian skin comprises hair follicles.

16. The method of claim 15 wherein growth of hair from the hair follicles increases by 10% or more.

17. The method of claim 13 wherein the wound is a sunburn or a topical abrasion.

18. The method of claim 11 further comprising:

applying the composition as a coating on a medical or surgical device selected from the group consisting of: a suture, an implant, a homeostatic plug, a wound dressing, a gauze bandage, and a pad.

19. A method for repairing mammalian skin

contacting the skin with a composition of claim 10 for a period of time sufficient for the cell growth enhancers, nutrients, extracellular matrix proteins, and stimulators of extracellular matrix to permeate mammalian skin in an amount effective to repair the skin.

20. A method for increasing hair growth on the skin of the mammalian scalp comprising:

contacting the skin of the mammalian scalp with a composition of claim 10 for a period of time sufficient for the cell growth enhancers, nutrients, extracellular matrix proteins, and stimulators of extracellular matrix to permeate the mammalian skin in an amount effective to increase hair growth.